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**Search Results -** Record(s) 1 through 6 of 6 returned.

☐ 1. Document ID: US 6377047 B1

L13: Entry 1 of 6

File: USPT

Apr 23, 2002

US-PAT-NO: 6377047

DOCUMENT-IDENTIFIER: US 6377047 B1

TITLE: Superconducting birdcage coils

DATE-ISSUED: April 23, 2002

INVENTOR-INFORMATION:

NAME CITY STATE ZIP CODE COUNTRY

Wong; Wai Ha San Jose CA Romo; Marco A. Castro Valley CA

ASSIGNEE-INFORMATION:

NAME CITY STATE ZIP CODE COUNTRY TYPE CODE

Varian, Inc. Palo Alto CA 02

APPL-NO: 09/589847 [PALM]
DATE FILED: June 8, 2000

INT-CL-ISSUED: [07] G01V 3/00

INT-CL-CURRENT:

TYPE IPC DATE

CIPP G01 R 33/34 20060101

US-CL-ISSUED: 324/318; 324/322 US-CL-CURRENT: 324/318; 324/322

FIELD-OF-CLASSIFICATION-SEARCH: 324/318, 324/319, 324/320, 324/321, 324/322,

324/309

See application file for complete search history.

PRIOR-ART-DISCLOSED:

#### U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4694255	September 1987	Hayes	324/318
<u>5258710</u>	November 1993	Black et al.	324/309
5276398	January 1994	Withers et al.	324/318
5351007	September 1994	Withers et al.	324/322
<u>5565778</u>	October 1996	Brey et al.	324/318
<u>5585723</u>	December 1996	Withers	324/318
<u>5594342</u>	January 1997	Brey et al.	324/322
5619140	April 1997	Brey et al.	324/318
<u>5974335</u>	October 1999	Talisa et al.	
6121776	September 2000	Marek	
6285189	September 2001	Wong	324/318

## FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO PUBN-DATE COUNTRY CLASS

1096266 WO 94/05022 May 2001

EP

March 1994

WO

## OTHER PUBLICATIONS

Conference Abstract by Wong, W.H. et al., entitled ""Millipede" Imaging Coil Design for High Field Micro Imaging Applications", published by Proc. Intl. Soc. Mag. Reson. Med. 8th Scientific Meeting and Exhibition, Denver, Colorado, USA, 1-7, Apr. 2000, vol. 2., p. 1399.

Article by Okada, H. et al., entitled "RF Coil for Low-Field MRI Coated With High-Temperature Superconductor", published by Journal of Magnetic Resonance, Series B, vol. 107, pp. 158-164, May 1995.

Article by Wen, H., entitled "The Design and Test of a New Volume Coil for High Field Imaging", published by Magnetic Resonance in Medicine, vol. 32, pp. 492-498 (1994).

Article by Vullo et al., entitled "Experimental Design and Fabrication of Birdcage Resonators for Magnetic Resonance Imaging" published in Magnetic Resonance in Medicine, vol. 24, pp. 243-252 (1992).

Article by Wen et al., entitled "Experimental Design and Fabrication of Birdcage Resonators for Magnetic Resonance Imaging" published in MRM, vol. 32, pp. 492-498 (1994).

ART-UNIT: 2862

PRIMARY-EXAMINER: Lefkowitz; Edward

ASSISTANT-EXAMINER: Fetzner; Tiffany A.

ATTY-AGENT-FIRM: Fishman; Bella

### **ABSTRACT:**

Superconducting birdcage coil with low-pass and high-pass coil configurations are formed by using strips each with an elongated sapphire substrate with a layer of a high temperature superconductor (HTS) material grown in a wavy pattern over its entire length on one of its main surfaces. A low-pass coil is formed with a pair of ring elements made of an electrically conductive metal and a plurality of such strips arranged parallel to one another and interconnecting these ring elements at junctions which are spaced peripherally along each of the rings. At each of the junctions, the ring element and the HTS layer form a capacitance. A highpass coil is formed by a plurality of such strips each with electrodes of the HTS material also grown at two end positions separated from each other on the other main surface of its sapphire substrates. These strips are arranged parallel to each other and sequentially around a central axis, each lying in a plane which includes the center axis. The electrodes and the HTS layers on mutually

adjacent pairs of strips are closely in face-to-face relationship so as to serve as the ring part of a birdcage configuration containing capacitors.

18 Claims, 14 Drawing figures

	le Citation Front Revie	
Reference		Claims KWMC Draw Desc Image

# ☐ 2. Document ID: US 5619140 A

L13: Entry 2 of 6 File: USPT

Apr 8, 1997

US-PAT-NO: <u>5619140</u>

DOCUMENT-IDENTIFIER: US 5619140 A

TITLE: Method of making nuclear magnetic resonance probe coil

DATE-ISSUED: April 8, 1997

INVENTOR-INFORMATION:

NAME CITY STATE ZIP CODE COUNTRY

Brey; William W. Sunnyvale CA Johansson; Marie E. Palo Alto CA Withers; Richard S. Sunnyvale CA

#### ASSIGNEE-INFORMATION:

NAME CITY STATE ZIP CODE COUNTRY TYPE CODE

Conductus, Inc. Sunnyvale CA 02

#### PARENT-CASE:

CROSS-REFERENCE TO RELATED APPLICATIONS This application is a continuation-in-part of U.S. patent application Ser. No. 08/409,506 by Richard S. Withers filed Mar. 23, 1995, now U.S. Pat. No. 5,585,723, and

a continuation-in-part of U.S. patent application Ser. No. 08/313,624 by Richard S. Withers, Guo-Chun Liang and Marie Johansson filed Sep. 27, 1994, now abandoned, which is a continuation-in-part of 891,591, U.S. Pat. No. 5,351,007 by Richard S. Withers and Guo-Chun Liang filed Jun. 1, 1992, each of which is incorporated herein by reference.

INT-CL-ISSUED: [06] G01V 3/00

INT-CL-CURRENT:

TYPE IPC DATE

CIPS G01 R 33/36 20060101 CIPS G01 R 33/34 20060101 CIPS G01 R 33/32 20060101 CIPS H01 G 4/40 20060101

US-CL-ISSUED: 324/318; 29/593 US-CL-CURRENT: 324/318; 29/593

FIELD-OF-CLASSIFICATION-SEARCH: 29/593, 29/599, 29/600, 29/601, 29/847, 324/318, 324/322, 324/300, 128/653.5

See application file for complete search history.

PRIOR-ART-DISCLOSED:

# U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4346537	August 1982	Masujima et al.	29/593
<u>4769883</u>	September 1988	Nathanson et al.	29/847
4783641	November 1988	Hayes et al.	324/318
4894316	January 1990	Hjulstrom	29/847
5172461	December 1992	Pichl	29/847

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO PUBN-DATE COUNTRY CLASS

WO94/05022 March 1994 WO

ART-UNIT: 225

PRIMARY-EXAMINER: Arana; Louis M.

ATTY-AGENT-FIRM: DeFranco, Esq.; Judith A.

### ABSTRACT:

A method of making a an NMR coil is provided. A coil is patterned of a film of a conductive material on a substrate. The coil mask is designed so that the resultant coil will have a lower resonant frequency than the desired frequency of the final coil. The coil is placed in an apparatus where it is exposed to increasing current, preferably within a magnetic field such as will be used during operation. The current is gradually increased and the coil observed for changes in its resonant frequency. When the coil is exposed to its operating current without further change in its resonant frequency, it is trimmed by removal of part of the capacitive element of the coil to the desired frequency.

7 Claims, 21 Drawing figures

Full Title	5002 4002 PM ( 4"~ 5 % LND N 002 40000 1001 0.% 5 % 5 % 0	Review Classific.	: \$ 1 (\$ 1 Y 100 1000 100 1 C 100 1
Reference		Claims Ki	MC   Draw Desc   Image

# ☐ 3. Document ID: US 5594342 A

L13: Entry 3 of 6 File: USPT Jan 14, 1997

US-PAT-NO: <u>5594342</u>

DOCUMENT-IDENTIFIER: US 5594342 A

TITLE: Nuclear magnetic resonance probe coil with enhanced current-carrying capability

DATE-ISSUED: January 14, 1997

#### INVENTOR-INFORMATION:

NAME CITY STATE ZIP CODE COUNTRY

Brey; William W. Sunnyvale CA Withers; Richard S. Sunnyvale CA

#### ASSIGNEE-INFORMATION:

NAME CITY STATE ZIP CODE COUNTRY TYPE CODE

Conductus, Inc. Sunnyvale CA 02

APPL-NO: 08/462663 [PALM]
DATE FILED: June 5, 1995

#### PARENT-CASE:

CROSS-REFERENCE TO RELATED APPLICATIONS This application is a continuation-in-part of U.S. patent application Ser. No. 08/409,506 by Richard S. Withers filed Mar. 23, 1995, and a continuation-in-part of U.S. patent application Ser. No. 08/313,624 by Richard S. Withers, Guo-Chun Liang and Marie Johansson filed Sep. 27, 1994 now abandoned, which is a continuation-in-part of Ser. No. 891,591, now U.S. Pat. No. 5,351,007 by Richard S. Withers and Guo-Chun Liang filed Jun. 1, 1992, each of which is incorporated herein by reference.

INT-CL-ISSUED: [06] G01V 3/00

INT-CL-CURRENT:

TYPE IPC DATE

CIPS G01 R 33/36 20060101

CIPS G01 R 33/34 20060101

CIPS G01 R 33/32 20060101

CIPS <u>H01</u> <u>G</u> <u>4/40</u> 20060101

US-CL-ISSUED: 324/322; 324/318 US-CL-CURRENT: <u>324/322</u>; <u>324/318</u> FIELD-OF-CLASSIFICATION-SEARCH: 324/318, 324/321, 324/322, 29/829, 29/846, 29/847, 505/192, 505/202, 505/220, 505/329, 505/844 See application file for complete search history.

PRIOR-ART-DISCLOSED:

# U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
2657310	October 1953	Runft	250/33
<u>3764938</u>	October 1973	Barnes	331/96
4346537	August 1982	Masujima et al.	51/413
4409608	October 1983	Yoder	357/51
4636730	January 1987	Bottomly	324/318
4769883	September 1988	Misic et al.	128/653.5
<u>4792790</u>	December 1988	Reeb	29/846
<u>4872068</u>	October 1989	Huang et al.	361/321
4894316	January 1990	Hjulstrom	430/316
<u>4894629</u>	January 1990	Okamura et al.	333/177
4981838	January 1991	Whitehead	505/1
<u>5061686</u>	October 1991	Ruby	565/1
5075281	December 1991	Testardi	505/1
5172461	December 1992	Pichl	29/25.42
5219827	June 1993	Higaki et al.	505/1
<u>5231078</u>	July 1993	Riebman et al.	505/192
<u>5247256</u>	September 1993	Marek	324/321
<u>5258710</u>	November 1993	Black et al.	324/309
<u>5276398</u>	January 1994	Withers et al.	324/318
5351007	September 1994	Withers et al.	324/322

FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO PUBN-DATE COUNTRY CLASS

WO94/05022 March 1994

#### OTHER PUBLICATIONS

WO

Gupta, et al., Computer-Aided Design of Microwave Circuits, ARTECH House, Inc. 217-220 (1981).

magnetic resonance microscopy" (Feb. 5 1993) Science259:793-795.

Banson, et al., "A probe for specimen magnetic resonance microscopy" (Feb. 1992). Investigative Radiology27:157-164. Black, et al., "A high-temperature superconducting receiver for nuclear

ART-UNIT: 225

PRIMARY-EXAMINER: Arana; Louis M.

ATTY-AGENT-FIRM: DeFranco; Judith A.

#### ABSTRACT:

The conductive material in an RF coil disposed in the polarizing field of an NMR apparatus in miminized and the current density at each point in the coil kept constant by providing an inductive element and a set of tapered, interidigtated capacitors having a uniform gap therebetween. The invention maximizes the current-carrying capacity of the coil.

18 Claims, 22 Drawing figures

Full Title Citation Front Review Classification Date	B1
Reference Claims KMC Draw. D	)esc   Image

# ☐ 4. Document ID: US 5585723 A

L13: Entry 4 of 6

File: USPT

Dec 17, 1996

US-PAT-NO: 5585723

DOCUMENT-IDENTIFIER: US 5585723 A

TITLE: Inductively coupled superconducting coil assembly

DATE-ISSUED: December 17, 1996

INVENTOR-INFORMATION:

NAME CITY STATE ZIP CODE COUNTRY

Withers; Richard S. Sunnyvale CA

ASSIGNEE-INFORMATION:

NAME CITY STATE ZIP CODE COUNTRY TYPE CODE

Conductus, Inc. Sunnyvale CA 02

APPL-NO: 08/409506 [PALM]
DATE FILED: March 23, 1995

INT-CL-ISSUED: [06] G01V 3/00

INT-CL-CURRENT:

TYPE IPC DATE

CIPP G01 R 33/34 20060101

US-CL-ISSUED: 324/318; 324/322 US-CL-CURRENT: 324/318; 324/322

FIELD-OF-CLASSIFICATION-SEARCH: 324/318, 324/321, 324/322, 29/829, 29/846, 29/847, 505/192, 505/202, 505/220, 505/329, 505/844

See application file for complete search history.

PRIOR-ART-DISCLOSED:

U.S. PATENT DOCUMENTS

PAT-NO ISSUE-DATE PATENTEE-NAME US-CL

<u>5003265</u> March 1991 Leussler 324/318

<u>5247256</u>	September 1993	Marek	324/321
5258710	November 1993	Black et al.	324/309
<u>5274332</u>	December 1993	Jaskolski et al.	324/318
<u>5276398</u>	January 1994	Withers et al.	324/318

#### OTHER PUBLICATIONS

Banson, et al., "A probe for specimen magnetic resonance microscopy" (1992) Invest. Radiol. 27:157-164.

Johnson, et al., "Histology by Magnetic Resonance Microscopy" (1993) Magnetic Resonance Quarterly 9:(1) 1-30.

ART-UNIT: 225

PRIMARY-EXAMINER: Arana; Louis M.

ATTY-AGENT-FIRM: DeFranco; Judith A.

#### ABSTRACT:

The invention provides highly sensitive NMR probes for spectroscopy and microscopy. Thin-film superconducting coils on planar substrates are inductively coupled to form an RF transmitter/receiver. Two embodiments are illustrated. The first, which is particularly suited to liquid samples, uses two coils are positioned on opposite sides of a sample, with their long axis parallel to the axis of the sample. The coils are sized and positioned to maximize SNR, field homogeneity or field strength. In the second embodiment, circular coils are deposited on a substrate having a central aperture. Several coils in a solenoidal configuration are positioned orthogonal to and surrounding the sample.

## 11 Claims, 8 Drawing figures

	iew Classification Date
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# ☐ 5. Document ID: US 5565778 A

L13: Entry 5 of 6

File: USPT

Oct 15, 1996

US-PAT-NO: 5565778

DOCUMENT-IDENTIFIER: US 5565778 A

TITLE: Nuclear magnetic resonance probe coil

DATE-ISSUED: October 15, 1996

INVENTOR-INFORMATION:

NAME CITY STATE ZIP CODE COUNTRY

Brey; William W. Sunnyvale CA Anderson; Weston A. Palo Alto CA Wong; Wai H. Monterey Park CA Fuks; Luiz F. Fremont CA Kotsubo; Vincent Y. Sunnyvale CA Withers; Richard S. Sunnyvale CA

#### ASSIGNEE-INFORMATION:

NAME CITY STATE ZIP CODE COUNTRY TYPE CODE

Conductus, Inc. Sunnyvale CA 02

APPL-NO: 08/461559 [PALM]
DATE FILED: June 5, 1995

#### PARENT-CASE:

CROSS-REFERENCE TO RELATED APPLICATIONS This application is a continuation-in-part of U.S. patent application Ser. No. 08/409,506, by Richard S. Withers filed Mar. 23, 1995, and a continuation-in-part of U.S. patent application Ser. No. 08/313,624, by Richard S. Withers, Guo-Chun Liang and Marie Johansson filed Sep. 27, 1994, now abandoned which is a continuation-in-part of Ser. No. 891,549, now U.S. Pat. No. 5,351,007, by Richard S. Withers and Guo-Chun Liang filed Jun. 1, 1992, each of which is incorporated herein by reference.

INT-CL-ISSUED: [06] G01V 3/00

INT-CL-CURRENT:

TYPE IPC DATE

CIPS G01 R 33/36 20060101

CIPS G01 R 33/34 20060101 CIPS G01 R 33/32 20060101 CIPS H01 G 4/40 20060101

US-CL-ISSUED: 324/318; 324/322 US-CL-CURRENT: 324/318; 324/322

FIELD-OF-CLASSIFICATION-SEARCH: 324/318, 324/321, 324/322, 29/829, 29/846, 29/847, 505/192, 505/202, 505/220, 505/329, 505/844
See application file for complete search history.

PRIOR-ART-DISCLOSED:

# U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL
4694283	September 1987	Reeb	29/846
5247256	September 1993	Marek	324/321
5258710	November 1993	Black et al.	324/309
5276398	January 1994	Withers et al.	324/318
5351007	September 1994	Withers et al.	324/322
5466480	November 1995	Zhou et al.	505/844

## FOREIGN PATENT DOCUMENTS

FOREIGN-PAT-NO	PUBN-DATE	COUNTRY	CLASS
WO94/05022	March 1994	WO	H1/H1G

#### OTHER PUBLICATIONS

Banson, et al., "A probe for specimen magnetic resonance microscopy" (Feb. 1992) Investigative Radiology 27:157-164. Black, et al., "A high-temperature superconducting receiver for nuclear

magnetic resonance microscopy" (Feb. 5 1993) Science 259:793-795.

ART-UNIT: 225

PRIMARY-EXAMINER: Arana; Louis M.

ATTY-AGENT-FIRM: DeFranco; Judith A.

#### **ABSTRACT:**

A resonant coil for nuclear magnetic spectroscopy and microscopy is provided, in which the coil is in the form of nested, interrupted loops of a conductive material forming a distributed inductive element and having a plurality of capacitive elements with capacitance distributed over the periphery of the loops. The coil is preferably formed as a thin film of a superconductive material on an electrically nonconductive substrate.

7 Claims, 21 Drawing figures

Full Title Citation Front Revi	ew Classification Date

# ☐ 6. Document ID: US 5258710 A

L13: Entry 6 of 6

File: USPT

Nov 2, 1993

US-PAT-NO: <u>5258710</u>

DOCUMENT-IDENTIFIER: US 5258710 A

TITLE: Cryogenic probe for NMR microscopy

DATE-ISSUED: November 2, 1993

# INVENTOR-INFORMATION:

NAME	CITY	STATE ZIP CODE COUNTRY
Black; Robert D.	Charlton	NY
Roemer; Peter B.	Schenectady	NY
Mogro-Campero; Antonio A.	Niskayuna	NY
Turner; Larry G.	Schenectady	NY

ASSIGNEE-INFORMATION:

NAME CITY STATE ZIP CODE COUNTRY TYPE CODE

General Electric Company Schenectady NY 02

APPL-NO: 07/858924 [PALM]
DATE FILED: March 27, 1992

INT-CL-ISSUED: [05] G01R 33/20

INT-CL-CURRENT:

TYPE IPC DATE

CIPS G01 R 33/31 20060101 CIPS G01 R 33/30 20060101 CIPS G01 R 33/34 20060101 CIPS F17 C 13/00 20060101

US-CL-ISSUED: 324/309; 324/307 US-CL-CURRENT: <u>324/309</u>; <u>324/307</u>

FIELD-OF-CLASSIFICATION-SEARCH: 335/216, 335/299, 324/300, 324/307, 324/309, 324/318, 324/319, 324/320, 324/322

See application file for complete search history.

PRIOR-ART-DISCLOSED:

## U.S. PATENT DOCUMENTS

PAT-NO	ISSUE-DATE	PATENTEE-NAME	US-CL	
<u>4509030</u>	April 1985	Vermilyea	335/216	
4667174	May 1987	MacKinnon et al.	335/299	

4694269	September 1987	Burnett et al.	335/216
4924185	May 1990	Matsutani	324/319
5136243	August 1992	Starewicz et al.	324/318

#### OTHER PUBLICATIONS

- R. Black, P. Roemer, W. Edelstein, S. Souza, A. Mogro-Campero and L. Turner, "Scaling Laws and Cryogenic Probes for NMR Microscopy", proceedings of the 10th Annual Conference of the Soc. of Magn. Reson., Aug. 10-16, 1991, p. 1250.
- J. Johnson, "Thermal Agitation of Electricity in Conductors", Physical Review, vol. 32, Jul. 1928, pp. 97-109.
- P. Styles, N. Soffe, C. Scott, D. Cragg, F. Row, D. White and P. White, "A High-Resolution NMR Probe in Which the Coil and Preamplifier are Cooled with Liquid Helium", Journal of Magnetic Resonance 60, pp. 397-404, 1984.
- A. Hall, N. Alford, T. Button and D. Gilderdale, "Improvements in High Temperature Superconductor Receiver Coils", Proceedings of the 10th Annual Conference of the Soc. of Magn. Reson. in Med., Aug. 10-16, 1991, p. 725.
- A. Mogro-Campero and L. Turner, "Lower Temperature Post-Annealing of Thin Films of YBa.sub.2 Cu.sub.3 O.sub.7 at Lower Oxygen Partial Pressure", Appl. Phys. Lett. 58(4), Jan. 28, 1991, pp. 417 and 418.

  M. Reynolds, "Resonant Recombination of Atomic Hydrogen and Deuterium at Low Temperatures", Thesis, The University of British Columbia, Feb. 1989, pp. 35-40.

ART-UNIT: 267

PRIMARY-EXAMINER: Tokar; Michael J.

ATTY-AGENT-FIRM: Zale; Lawrence P. Snyder; Marvin

#### ABSTRACT:

An apparatus for microscopic imaging employing nuclear magnetic resonance is constructed from a cryogenic probe which is situated in a conventional magnetic resonance imaging system. The cryogenic probe employs a number of chambers and cryogenic liquids which cool a superconductor resonator to very low temperatures. A sample tube for containing a small specimen is heated to a temperature above its freezing point by flowing nitrogen gas over the specimen. A secondary resonant circuit is inductively coupled to the superconducting resonator. A transceiver passes RF signals to be transmitted into the specimen through the secondary resonant circuit causing the superconducting resonator to transmit the RF signal into the specimen.

The resonator then acts as a receive coil and receives a signal from the specimen which is inductively passed to the secondary resonator circuit from which an image is generated. The use of superconductors having low resistance and low temperatures causes noise to be significantly reduced, and the signal-to-noise ratio to be substantially increased.

20 Claims, 17 Drawing figures

Full   1	itle Citation Front Review Classification Date  Claims KWIC Draw Desc Image		
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	Generate OACS		
Ter	n	Documents	
"52	"5258710"		
"55	"5565778"		
"55	"5585723"		
"55	"5594342"		
"56	19140"	1	
"63	77047"	1	
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'6377047')![PN]).USPT,PGPB.